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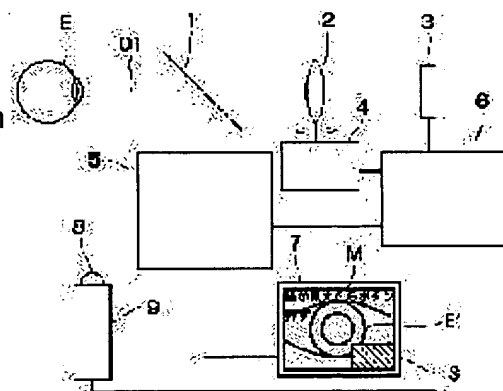
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(54) OPHTHALMOLOGIC APPARATUS

(57)Abstract:

PROBLEM TO BE SOLVED: To achieve a subjective/objective measurement of refraction simply with a simple structure using no specific optical member.

SOLUTION: A diopter varying lens 2 is set at the position of the degree of refraction of an angle of astigmatism by an objective measurement of refractivity and a stripe target vertical to an objective angle of astigmatism is shown on a liquid crystal image display device 3 to be presented on an examinee. An examiner drives the diopter varying lens 2 by a drive means 4 to alter the diopter of the target, an indicative message M to an examinee is displayed on a TV monitor 7 and when the examinee sees the stripe, he responds by depressing a response button 8. The stripe is automatically changed by a program from a fine to coarse pitch to determine a stripe vision at the meridian of the angle of astigmatism by the response button 8 of the examinee. Then, the degree of refraction is determined respectively based on two main meridians, the meridian of a subjective angle of astigmatism and a meridian vertical thereto. The stripe target is presented in the direction vertical to the main meridians and at a pitch equivalent to a stripe vision in the direction. The lens 2 is driven to move the diopter of the target gradually to a shorter distance from a longer distance and the diopter of the target as given when the response button 8 is depressed by an examiner is defined as the degree of



refraction. Thus, a refraction value containing the astigmatism from the directions of both the main meridians and the degree of refraction is obtained.

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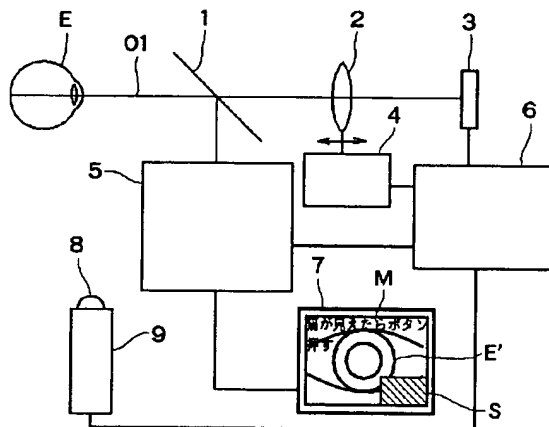
(74) 代理人 弁理士 日比谷 征彦

(54) 【発明の名称】 検眼装置

(57) 【要約】

【課題】 特殊な光学部材を使わない簡素な構成で、簡便に他覚屈折測定を行う。

【解決手段】 他覚屈折力測定による乱視角度の屈折度位置に視度可変レンズ2を設定し、液晶画像表示器3に他覚乱視角に垂直な縞視標を表示し、被検者に呈示する。検者は駆動手段4により視度可変レンズ2を駆動して視標視度を変更し、テレビモニタ7には被検者への指示メッセージMが表示され、被検者は縞が見えたら応答釦8を押して応答する。プログラムにより自動的にピッチの細かい縞から徐々に粗い縞に変化させ、被検者の応答釦8により乱視角経線の縞視力を決定する。次に、自覚的な乱視角経線とそれに垂直な経線の2つの主経線でそれぞれ屈折度を求める。その主経線に垂直方向でかつその方向の縞視力に相当するピッチの縞視標を呈示し、視度可変レンズ2を駆動して遠方から徐々に近方に視標視度を移動し、検者により応答釦8が押されたときの視標視度が屈折度となり、両主経線の方向と屈折度から乱視を含む屈折値を求めることができる。



【特許請求の範囲】

【請求項1】 眼底に光束を投影し反射光を光電検出して乱視を含む屈折値を測定する測定手段と、該測定手段により測定した被検眼の主経線方向の縞視標を視度可変に被検眼に呈示する視標光学系とを有することを特徴とする検眼装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、オートレフラクトメータ等の検眼装置に関するものである。

【0002】

【従来の技術】従来から、所定方向の縞視標を用いて乱視を含む自覚屈折力測定を行う装置が提案されている。

【0003】

【発明が解決しようとする課題】しかしながら上述の従来例においては、被検者の乱視が大きくて乱視角度が呈示視標の縞の方向と異なるときには、被検者には縞がぼけて見え、屈折力測定ができないという問題点がある。

【0004】本発明の目的は、上述の問題点を解消し、簡素な構成で簡単に他覚屈折力測定を行う検眼装置を提供することにある。

【0005】

【課題を解決するための手段】上記目的を達成するための本発明に係る検眼装置は、眼底に光束を投影し反射光を光電検出して乱視を含む屈折値を測定する測定手段と、該測定手段により測定した被検眼の主経線方向の縞視標を視度可変に被検眼に呈示する視標光学系とを有することを特徴とする。

【0006】

【発明の実施の形態】本発明を図示の実施例に基づいて詳細に説明する。図1は実施例の自覚屈折力測定装置の構成図を示し、被検眼Eの前方の光路01上には、赤外光束を反射し可視光を透過するダイクロイックミラー1、視度可変レンズ2、他覚屈折力及び自覚屈折力測定に使用する視標をビデオ画像等で表示する液晶画像表示器3が配列され、視度可変レンズ2には駆動手段4が連結されている。ダイクロイックミラー1の反射方向には、前眼部撮像用のビデオカメラを含む他覚屈折力測定系5が配置され、この他覚屈折力測定系5の出力はパターン発生回路や演算手段を含む制御手段6、テレビモニタ7にそれぞれ接続されている。また、制御手段6の出力は液晶画像表示器3、駆動手段4にそれぞれ接続され、応答釦8を有する被検者応答手段9の出力が制御手段6に接続されている。

【0007】初めに他覚屈折力測定を行うと、液晶画像表示器3に遠景像を表示し、被検者はダイクロイックミラー1、視度可変レンズ2を通して液晶画像表示器3の視標を見る。他覚屈折測定系5により、ダイクロイックミラー1を介して被検眼Eの眼底に光束を投影し、眼底からの反射光をビデオカメラで光電検出する。検者はテ

レビモニタ7に表示された前眼部映像E'を見て操作を行い、乱視を含む屈折値を測定する。

【0008】次に、他覚屈折測定による屈折値情報を使って自覚屈折力測定を行う。まず乱視角度を測定するために、他覚屈折力測定による乱視角度の屈折度位置に視度可変レンズ2を設定する。制御手段6により、液晶画像表示器3に他覚乱視角に垂直方向の縞視標を表示して被検者に呈示し、被検者はダイクロイックミラー1、視度可変レンズ2を通して液晶画像表示器3のこの縞視標を見る。

【0009】検者は制御手段6により駆動手段4を制御して、光路01方向に視度可変レンズ2を駆動して視標視度を変更し、テレビモニタ7には被検者への指示メッセージMが表示され、検者はそれを見て指示を行う。被検者は片手で被検者応答手段9を握り、縞が見えたら応答釦8を押して応答する。制御手段6はプログラムにより自動的にピッチの細かい縞から徐々に粗い縞に変化させ、被検者による応答釦8の信号が制御手段6に入力されて乱視角経線の縞視力が決定される。

【0010】続いて、先に求めた角度から縞の方向を両方向に少し変更して、順次に縞視力を測定する。この変更する角度は5〜20度程度とし、乱視度により決定し、他覚的に求めた乱視が小さければ大きな角度とし、大きければ小さな角度とする。主経線角度の1つである乱視角に縞方向が一致していれば最も良い縞視力が得られ、一方で乱視角と縞方向が一致していなければ縞視力は低下する。3方向の角度の縞視力からどの角度で最高の縞視力が得られるかを演算し、自覚乱視角とその縞視力を求める。他覚乱視角と自覚乱視角が一致していれば、他覚乱視角に垂直方向の縞視標での縞視力が最も良く、その前後の角度の縞視標の縞視力はそれより同じ程度に低下する。

【0011】次に、自覚的な乱視角経線とそれに垂直な経線の2つの主経線でそれぞれ屈折度を求める。経線の屈折度を測定する場合には、その主経線に垂直方向でかつその方向の縞視力に相当するピッチの縞視標を呈示し、視度可変レンズ2を駆動して遠方から徐々に近方に視標視度を移動し、縞が見えたら応答釦8を押すように被検者に指示する。応答釦8が押されたときの視標視度が屈折度となり、両主経線の間と屈折度から乱視を含む屈折値を求めることができる。

【0012】これらの一連の工程は、プログラムに従って自動的に進められるので、検者はテレビモニタ7で被検眼Eを監視して、指示メッセージMが表示されたら口頭で指示を行うだけでよく、また被検者は縞が見えたら応答釦8を押すだけの簡単な作業でよい。また、液晶画像表示器3に呈示している縞パターンと視標視度はテレビモニタ7の小画面Sに表示されているので、検者は何が行われているかを常に把握することができる。

【0013】

【発明の効果】以上説明したように本発明に係る検眼装置は、眼底に光束を投影し反射光を光電検出して乱視を含む屈折値を測定し、この測定した屈折値に対応する主経線方向の縞視標を視度可変に被検眼に呈示して検眼を行うことにより、簡素な構成の光学系で簡便な操作により自覚屈折力測定を行うことができる。

【図面の簡単な説明】

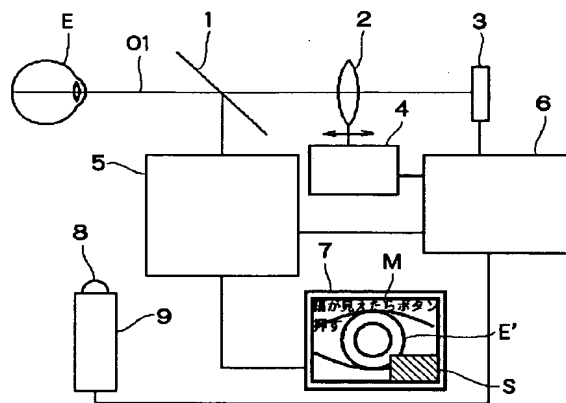
【図1】実施例の自他覚屈折力測定装置の構成図である。

【符号の説明】

- * 1 ダイクロイックミラー
- 2 視度可変レンズ
- 3 液晶画像表示器
- 4 駆動手段
- 5 他覚屈折測定系
- 6 制御手段
- 7 テレビモニタ
- 8 応答釦
- 9 被検者応答手段

*10

【図1】



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CLAIMS

[Claim(s)]

[Claim 1] Optometry equipment characterized by having a measurement means to measure the refractive value which projects the flux of light on eyegrounds, carries out photoelectrical detection of the reflected light, and includes the astigmatism, and the target optical system which shows the striped target of the direction of principal meridians examined [which was measured with this measurement means] the eyes to optometry-ed the diopter adjustable.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to optometry equipments, such as autorefractometer.

[0002]

[Description of the Prior Art] The equipment which performs from the former consciousness refractive-power measurement which includes the

astigmatism using the striped target of the predetermined direction is proposed.

[0003]

[Problem(s) to be Solved by the Invention] However, in the above-mentioned conventional example, when the astigmatism of the subject is large and an astigmatism include angle differs from the direction of the stripes of a presentation target, stripes fade and are visible to the subject and there is a trouble that refractive-power measurement cannot be performed.

[0004] The purpose of this invention cancels an above-mentioned trouble, and is to offer the optometry equipment which performs oneself-and-others ***** measurement simple with a simple configuration.

[0005]

[Means for Solving the Problem] The optometry equipment concerning this invention for attaining the above-mentioned purpose is characterized by having a measurement means to measure the refractive value which projects the flux of light on eyegrounds, carries out photoelectrical detection of the reflected light, and includes the astigmatism, and the target optical system which shows the striped target of the direction of principal meridians examined [which was measured with this measurement means] the eyes to optometry-ed the diopter adjustable.

[0006]

[Embodiment of the Invention] This invention is explained to a detail based on the example of illustration. The liquid crystal image display machine 3 which displays the target used for the dichroic mirror 1 which drawing 1 shows the block diagram of the oneself-and-others ***** measuring device of an example, reflects an infrared light bundle on the optical path 01 of the front examined [E] the eyes, and penetrates the light, the diopter adjustable lens 2, other ***** , and consciousness refractive-power measurement with a video image etc. is arranged, and the driving means 4 is connected with the diopter adjustable lens 2. In the reflective direction of a dichroic mirror 1, other ***** system of measurement 5 containing the video camera for an anterior eye segment image pick-up is arranged, in addition the output of the ***** system of measurement 5 is connected to a control means 6 and television monitor 7 including a pattern generating circuit or an operation means, respectively. Moreover, the output of a control means 6 is connected to the liquid crystal image display machine 3 and a driving means 4, respectively, and the output of a subject response means 9 to have Respond button 8 is connected to the control means 6.

[0007] If ***** measurement besides introduction is performed, a

distant view image will be displayed on the liquid crystal image display machine 3, and the subject will look at the target of the liquid crystal image display machine 3 through a dichroic mirror 1 and the diopter adjustable lens 2. According to other ***** system of measurement 5, the flux of light is projected on eyegrounds examined [E] the eyes through a dichroic mirror 1, and photoelectrical detection of the reflected light from eyegrounds is carried out with a video camera. A ** person operates it by seeing anterior eye segment image E' displayed on the television monitor 7, and measures a refractive value including the astigmatism.

[0008] Next, consciousness refractive-power measurement is performed using the refractive value information by other *****. In order to measure an astigmatism include angle first, the diopter adjustable lens 2 is set as the refractivity location of the astigmatism include angle by other ***** measurement. By the control means 6, a vertical striped target is displayed on the liquid crystal image display machine 3 at other ***** , it shows the subject, and the subject looks at this striped target of the liquid crystal image display machine 3 through a dichroic mirror 1 and the diopter adjustable lens 2.

[0009] A ** person controls a driving means 4 by the control means 6, drives the diopter adjustable lens 2 in the optical-path 01 direction, and changes a target diopter into it, prompting message M to the subject is displayed on a television monitor 7, and a ** person looks at it and directs. The subject grasps the subject response means 9 single hand, and if stripes are in sight, Respond button 8 will be pushed and it will answer. A control means 6 is automatically changed from stripes with a fine pitch to coarse stripes gradually by the program, the signal of Respond button 8 by the subject is inputted into a control means 6, and the striped eyesight of astigmatism angle circles of longitude is determined.

[0010] Then, the direction of striped is changed into both directions a little from the include angle for which it asked previously, and striped eyesight is measured one by one. It considers as about 5 - 20 degrees, whenever [astigmatism] determines this include angle to change, if its astigmatism searched for in other ** is small, it will be made into a big include angle, and if large, let it be a small include angle. If the direction of stripes is in agreement with the astigmatism angle which is one of the principal-meridians include angles and the astigmatism angle and the direction of stripes are not [the best striped eyesight is acquired and] in agreement by one side, striped eyesight declines. It calculates the striped eyesight highest at which include angle is

acquired from the striped eyesight of the include angle of three directions, and a consciousness astigmatism angle and its striped eyesight are searched for. If other ***** and a consciousness astigmatism angle are in agreement, the striped eyesight in a vertical striped target will be the best for other *****, and the striped eyesight of the striped target of the include angle before and behind that will fall to same extent from it.

[0011] Next, it asks for refractivity, respectively by subjective astigmatism angle circles of longitude and two principal meridians of circles of longitude perpendicular to it. In measuring the refractivity of circles of longitude, it is perpendicular to the principal meridians, and the striped target of the pitch equivalent to the striped eyesight of the direction is shown, the diopter adjustable lens 2 is driven and a target diopter is gradually moved to the method of Kon from a distant place, and if stripes are in sight, it directs to push Respond button 8 to the subject. A target diopter when Respond button 8 is pushed turns into refractivity, and the refractive value which includes the astigmatism from the direction and refractivity of both principal meridians can be calculated.

[0012] Since these processes of a series of are automatically advanced according to a program, when stripes are in sight as for the subject, it is [that a ** person should just direct orally when the optometry E-ed is supervised by the television monitor 7 and prompting message M is . displayed] good at the easy activity which pushes Respond button 8. Moreover, since the striped pattern and target diopter which have been shown to the liquid crystal image display machine 3 are displayed on the small screen S of a television monitor 7, a ** person can always grasp what is performed.

[0013]

[Effect of the Invention] Simple actuation can perform consciousness refractive-power measurement by the optical system of a simple configuration by the optometry equipment concerning this invention measuring the refractive value which projects the flux of light on eyegrounds, carries out photoelectrical detection of the reflected light, and includes the astigmatism, as explained above, and examining the eyes by showing the striped target of the direction of principal meridians corresponding to this measured refractive value to optometry-ed the diopter adjustable.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram of the oneself-and-others ***** measuring device of an example.

[Description of Notations]

- 1 Dichroic Mirror
- 2 Diopter Adjustable Lens
- 3 Liquid Crystal Image Display Machine
- 4 Driving Means
- 5 Other ***** System of Measurement
- 6 Control Means
- 7 Television Monitor
- 8 Respond Button
- 9 Subject Response Means

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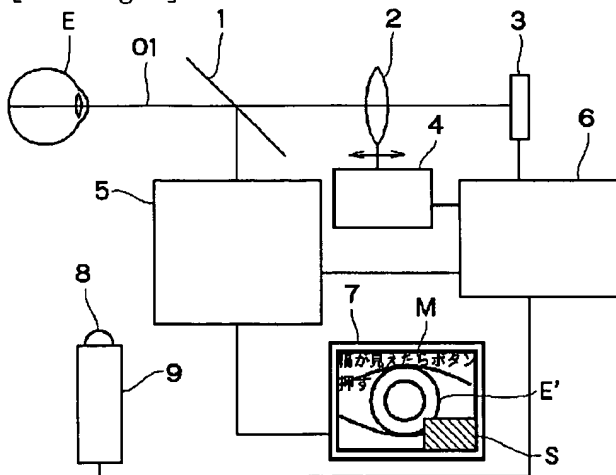
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DRAWINGS

[Drawing 1]



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